PROCESSING AND INTERPRETATION OF WATERBORNE ELECTRICAL RESISTIVITY IMAGING (ERI)

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Management of dynamic coasts is challenging, especially in urbanized settings where anthropogenic activities, along with the natural processes, shape coastal development. Sand management, an important aspect of coastal management programs, is heavily affected by all coastal processes and activities. The detailed mapping of underwater sand distribution and thickness is important for developing an accurate local sand transport model. Such a model can be used, in turn, to guide decisions regarding protection and improvements of critical coastal infrastructure, and to support the characterization of beach nourishment methods.

Many methods are utilized for coastal characterization and sand mapping. The different methods offer either high accuracy, but limited resolution (e.g. sand probing, coring) or high spatial coverage but limited depth resolution (e.g. airborne mapping). The mode of application of geophysical methods has an impact on spatial coverage and vertical resolution. We used waterborne electrical resistivity imaging (wERI) in an effort to bridge the gap between high vertical resolution and spatial coverage. We performed a wERI survey along the near-shore Illinois coastal zone of Lake Michigan, to assist with ongoing coastal management efforts. wERI proved to be a very efficient tool for this environment, covering relatively large areas in a short time while providing high quality data, associated with the low conductivity fresh water of the lake. Early data processing and interpretation efforts focused around interpolated 1D inversions. The resulting sand thickness map was geologically reasonable but showed inconsistencies and was in places not in agreement with the other collected data. Reprocessing and inversion of the data with state of the art 3D inversion codes allowed the development of a detailed sand distribution map, in agreement with the independent point measurements. wERI appears to be a good candidate to bridge large scale / low resolution and point / high resolution current coastal characterization approaches.